

WHAT IS CLAIMED IS:

1. A periodic control synchronous system for synchronizing periodic control between one or more controllers connected to a network and one or more devices 5 connected to said network,

wherein each of said controller and device comprise a global timer which is controlled through said network, and

10 synchronization of periodic control is performed by generating synchronous timing for periodic control by using the global time indicated by said global timer.

2. The periodic control synchronous system according to claim 1,

15 wherein said global timer of said controller is set at a master global timer,

said global timer of said device is set at a slave global timer,

20 said controller comprises a transmitting unit which transmits the periodic timing time using the global time indicated by the master global timer to said device as a period transfer packet, and

25 said device comprises a periodic control unit which performs periodic control by using the synchronous timing time of the periodic transfer packet transmitted by said

transmitting unit and the global time indicated by said slave global timer.

3. The periodic control synchronous system according to  
5 claim 1, wherein said device further includes,  
an operation period timer which controls said  
operation period of said device itself; and  
a correcting unit which corrects said operation period  
timer by determining the time difference between the global  
10 time indicated by said global timer of said device and the  
synchronous timing time indicated by said controller at the  
synchronous timing indicated by said operation period timer,  
and determines the timer correction value or timer period  
correction value of said operation period timer on the basis  
15 of the obtained time difference.

4. The periodic control synchronous system according to  
claim 3, wherein said correcting unit includes,  
a detecting unit which detects whether the time  
20 difference is within a specified allowable range or not,  
and  
controls to correct said operation period timer on  
the basis of the timer correction value or timer period  
correction value when the time difference is within the  
25 specified allowable range, and not to correct said operation

period timer when the time difference is out of the specified allowable range.

5. The periodic control synchronous system according to  
5 claim 1, wherein said controller further includes,  
a control period timer which controls the control period of said controller itself; and  
a correcting unit which corrects said control period timer by determining the time difference between the global  
10 time indicated by said global timer of said controller and the synchronous timing time indicated by said controller at the synchronous timing indicated by said control period timer, and determines the timer correction value or timer period correction value of said control period timer on the basis  
15 of the obtained time difference.

6. The periodic control synchronous system according to  
claim 5, wherein said correcting unit includes,  
a detecting unit which detects whether the time  
20 difference is within a specified allowable range or not, and  
controls to correct said control period timer on the basis of the timer correction value or timer period correction value when the time difference is within the  
25 specified allowable range, and not to correct said control

period timer when the time difference is out of the specified allowable range.

7. A periodic control synchronous system for  
5 synchronizing periodic control between one or more controllers connected to a network and one or more devices connected to said network,

wherein said controller includes,  
a first global timer which is controlled through said  
10 network;

a control period timer which controls the control period of periodic control;

a time stamp providing unit which provides the periodic transfer packet with the time stamp showing the synchronous  
15 timing of the period control designated by said control period timer by using the global time indicated by said first global timer; and

a transmitting unit which transmits the periodic transfer packet provided with the time stamp to said device,  
20 and

said device includes,  
a second global timer which is controlled through said network; and

a periodic control unit which synchronizes said  
25 operation period of said device with the control period by

using the synchronous timing time of the periodic control indicated by the time stamp of the periodic transfer packet transmitted by said transmitting unit and the global time indicated by said second global timer.

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8. The periodic control synchronous system according to claim 7,

wherein said controller comprises a latch unit which latches the global time of said first global timer, and holds  
10 the latched time,

said control period timer latches the global time of said first global timer in said latch unit at the synchronous timing of the periodic control designated by said control period timer, and

15 said time stamp providing unit provides the periodic transfer packet with the time stamp having the global time latched by said latch unit offset by the portion of the control period.

20 9. The periodic control synchronous system according to claim 7,

wherein said device includes,  
an operation control period timer which controls said operation period of said device itself;  
25 a comparing unit which compares the synchronous timing

time of the periodic control indicated by the time stamp of the periodic transfer packet transmitted by said transmitting unit and the global time indicated by said second global timer; and

5           a correcting unit which corrects said operation period timer by determining the time difference between the synchronous timing time of the periodic control indicated by the time stamp compared by said comparing unit and the global time indicated by said second global timer at the 10 synchronous timing indicated by said operation period timer, and determines the timer correction value or timer period correction value of said operation period timer on the basis of the obtained time difference.

15 10. The periodic control synchronous system according to claim 9,

wherein said correcting unit includes,  
a detecting unit which detects whether the time difference is within a specified allowable range or not;  
20 and

controls to correct said operation period timer on the basis of the timer correction value or timer period correction value when the time difference is within the specified allowable range, and not to correct said operation period timer when the time difference is out of the specified 25

allowable range.

11. The periodic control synchronous system according to  
claim 7,

5 wherein said device includes,

an operation control period timer which controls said  
operation period of said device itself;

10 a comparing unit which compares the synchronous timing  
time of the periodic control indicated by the time stamp  
of the periodic transfer packet transmitted by said  
transmitting unit and the global time indicated by said  
second global timer; and

15 a correcting unit which resets said operation period  
timer when the global time indicated by said second global  
timer reaches the synchronous timing time of the periodic  
control indicated by the time stamp.

12. The periodic control synchronous system according to  
claim 11,

20 wherein said correcting unit resets said operation  
period timer when reaching the synchronous timing indicated  
by said operation period timer before the global time  
indicated by said second global timer reaches the synchronous  
timing time of the periodic control indicated by the time  
25 stamp, and resets said operation period timer again later

when the synchronous timing time of the periodic control indicated by the time stamp reaches or exceeds the global time indicated by said second global timer.

5 13. The periodic control synchronous system according to  
claim 11,

wherein said correcting unit includes,

10 a detecting unit which detects whether the time difference between the synchronous timing time of the periodic control indicated by the time stamp compared by said comparing unit and the global time indicated by said second global timer at the synchronous timing indicated by said operation period timer is within a specified allowable range or not, and

15 controls not to correct said operation period timer when the time difference is out of the specified allowable range.

14. The periodic control synchronous system according to  
20 claim 11,

wherein said correcting unit determines the timer periodic correction value of said operation period timer by finding the value of said operation period timer at the synchronous timing of the periodic control indicated by the  
25 time stamp, or determines the timer periodic correction value

of said operation period timer from the time difference  
between the synchronous timing time of the periodic control  
indicated by the time stamp and the global time indicated  
by said second global timer, and thereby corrects said  
5 operation period timer on the basis of the obtained timer  
periodic correction value.

15. A periodic control synchronous system for  
synchronizing periodic control between controllers  
10 connected to first and networks, and one or more devices  
connected to said first network one or more devices connected  
to said second network,

wherein said controller includes,  
a first global timer controlled through said first  
15 network;

a second global timer controlled through said second  
network;

a control period timer which controls the control  
period of periodic control of said periodic control  
20 synchronous system;

a time stamp providing unit which provides the periodic  
transfer packet transmitted periodically to said first and  
second networks with the time stamp showing the synchronous  
timing of the period control designated by said control  
25 period timer by using the global time indicated by said first

and second global timers;

a first transmitting unit which transmits the periodic transfer packet provided with the time stamp to one or more devices connected to the corresponding first network; and

5 a second transmitting unit which transmits the periodic transfer packet provided with the time stamp to one or more devices connected to the corresponding second network,

each one of one or more devices connected to said first  
10 and second networks include,

a third global timer controlled respectively through  
said first and second networks; and

a periodic control unit which synchronizes said  
operation period of the corresponding device with the control  
15 period by using the synchronous timing time of the periodic  
control indicated by the time stamp of the periodic transfer  
packet transmitted by said first and second transmitting  
units and the global time indicated by said third global  
timer.

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16. The periodic control synchronous system according to  
claim 15,

wherein said controller includes,

a first latch unit which latches the global time of  
25 said first global timer, and holds the latched time; and

a second latch unit which latches the global time of said second global timer, and holds the latched time,

wherein said control period timer latches the global time of said first and second global timers in said first 5 and second latch unit at the synchronous timing of the periodic control designated by said control period timer, and

said time stamp providing unit provides the periodic transfer packet with the time stamp having the global time 10 latched by said first and second latch units offset by the portion of the control period.